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ORIGINAL PAPER

Exploring Engagement in Shared Reading Activities Between Children with Autism Spectrum Disorder and Their Caregivers

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Abstract
Reading aloud to children is a valued practice to promote emergent literacy and language skills that form the foundation for future reading success. We conducted a descriptive study of shared book reading practices between caregivers and their children with autism spectrum disorder (n = 17) and caregivers and their typically developing children (n = 20) to identify factors that can promote or inhibit children's engagement in reading. Caregivers and their children read nine books (familiar, non-fiction, fiction). Children with ASD demonstrated lower levels of passive engagement (looking at the book) and higher levels of non-engaged behavior compared to typically developing children. Caregiver reading quality and book type contributed to joint engagement during reading. Implications of these findings for intervention development are discussed.

Keywords Autism spectrum disorder · Parents · Reading · Preschool

Introduction

Academic difficulties are not a benchmark criterion of autism spectrum disorder (ASD), however, deficits in social-communication and social interaction that are defining characteristics of ASD (American Psychiatric Association [APA] 2013) may disadvantage children with ASD from naturally developing school readiness skills (Estes et al. 2011; Lloyd et al. 2009). Specifically, social communication is a significant predictor of reading comprehension (Ricketts et al. 2013). A longitudinal study of reading achievement of students with ASD revealed that the rate of their reading improvement is significantly slower than that of students with learning disabilities (Wei et al. 2011). Recently, researchers have found that many young children with ASD demonstrate emergent literacy deficits as early as preschool particularly in the ability to draw meaning from language and texts (Fleury and Lease 2018; Westerveld et al. 2017). Without intervention, early difficulties in language and literacy often translate into persistent reading deficits (Cunningham and Stanovich 1997; Tabors et al. 2001).

Reading aloud to children is a traditional early learning activity from which children learn emergent literacy skills that are foundational for reading success (NELP 2008; Schickedanz and McGee 2010; Whitehurst and Lonigan 1998). Shared reading interventions have been thoroughly studied in typically developing and at-risk populations (What Works Clearinghouse; U.S. Department of Education) and is a promising practice for children with ASD (Fleury et al. 2014; Fleury and Schwartz 2017; Whalon et al. 2016, 2015). Seminal studies of shared reading interventions have traditionally focused on literacy or language outcomes as the primary variable of interest. Children's engagement during reading are not commonly measured in shared reading studies, but may be pertinent for children with ASD given that characteristics associated with the disorder can prevent active participation in routine learning activities (Dykstra Steinbrenner and Watson 2015). Underlying engagement in social activities is *joint attention*, the visual sharing of attention with a social partner in reference to an object of event of mutual interest (Carpenter et al. 1998). Its function is to nonverbally "comment" through shifting one's gaze, showing, or pointing for the sole purpose of indicating and sharing interest about a common focus of attention (Mundy and Stella 2000). Young children with ASD demonstrate

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lower levels of joint attention compared to typically developing children and age-matched peers with Down syndrome (Adamson et al. 2009), which has implications for the overall quality of engagement during activities that rely heavily on social interaction.

Shared book reading activities during the early childhood years are primarily social in nature. High quality shared book reading activities rely upon reciprocal interaction throughout the reading to scaffold children's learning (Kaderavek and Rabidoux 2004; Wasik and Bond 2001). Children are expected to not only respond to adult questions, but extend the conversation by asking their own questions and making comments about what they notice. Shared reading activities between a caregiver and their child involve sustained social interaction regarding a particular topic, which can be challenging for many children with ASD due to their difficulties with social communication and joint attention (Dawson et al. 2004; Tager-Flusberg and Joseph 2003). Caregivers of young children with ASD report that their children are less likely to request or enjoy shared reading compared to their language-matched peers (Lanter et al. 2013) and that they attend to shared reading for less time compared to their peers (Watson et al. 1996). Because the design of many literacy activities relies heavily on social communication ability, children who lack basic skills in these areas will have difficulty participating in, and benefiting from, these activities without instructional support (Kluth and Chandler-Olcott 2008).

Measuring Engagement

Engagement of young children with ASD has been investigated in both structured and unstructured activities (Burstein 1986; Kemp et al. 2013); however, methods for measuring and assessing engagement vary across studies. Previous research groups have approximated engagement through measures of attention (e.g., McWilliam and Bailey 1994), on-task behavior (e.g., Miramontez and Schwartz 2012), and task completion (e.g., Ok and Kim 2016). The context for these aforementioned studies is unstructured classroom activities, which vary in terms of social demand. Shared reading intervention research for children with ASD have included measures that approximate children's social engagement during shared reading activities, such as responding to adult questions (Fleury and Schwartz 2017; Whalon et al. 2015); initiating questions or comments (Fleury and Schwartz 2017; Whalon et al. 2015); and looking at materials and/or the reader (Fleury et al. 2014). These measures are rather narrow in focus and primarily emphasize the quantity of engagement rather than qualitative aspects of interacting with the individuals and materials in the environment.

Researchers have begun to categorize qualitative subtypes of engagement (Adamson et al. 2004; Boyd et al. 2008; Wong and Kasari 2012) in addition to the commonly used frequency and duration measures. These researchers acknowledge that engagement is not an "all or nothing" phenomenon; rather engagement can fluctuate on a qualitative continuum ranging from passive engagement to single engagement, to joint engagement. Adamson et al. (2004) differentiate between *onlooking behavior*, a type of passive engagement in which a child observes others engaging in activities but does not manipulate materials or interact with peers or adults and *coordinated joint engagement*, which requires that children interact with both the materials and other individuals within a given activity. Assessing both the quantity and quality of engagement may allow researchers to better capture the nuances of children's participation in activities that rely heavily on social interaction such as shared reading.

Shared Book Reading Factors that Influence Engagement

In contemporary behavioral research, carefully crafted descriptive studies are used to identify specific variables that, if manipulated, will change an important outcome. In the next section, we explore the extent to which three malleable factors potentially relate to shared reading engagement for children with ASD: caregiver reading quality, book type, and repeated readings.

Caregiver Reading Quality

Adults vary in their approaches to reading with children. The seminal work of Heath (1982) established differences in caregivers' reading interactions with their children based on socioeconomic status. More recent research established differences across other demographic characteristics including caregivers' education level (Demir et al. 2012), cultural identification (Chan et al. 2009; Hammer et al. 2005), and child characteristics such as reading ability (Stoltz and Fischel 2003). The observed differences in adult reading styles relate to different outcomes for children's literacy skills (Chow et al. 2008; Ezell et al. 2000; Hargrave and Senechal 2000), suggesting that quality of book reading is important.

Researchers have established specific strategies to improve the quality of shared book reading experiences. Dialogic reading is a widely recognized method of shared reading in which adults embed a number of specific question prompts to encourage children to actively engage in the story (What Works Clearinghouse; Institute of Education Sciences). Fleury et al. (2014, 2017) evaluated the appropriateness of using this technique for preschool

children with ASD. Baseline book reading session that consisted of adults reading "as they would typically" resulted in minimal verbal participation by children in the study. The use of dialogic reading strategies resulted in immediate increases in levels of verbal participation (Fleury et al. 2014; Fleury and Schwartz 2017) and collateral benefits in vocabulary growth (Fleury and Schwartz 2017). These studies provide empirical demonstration that many adults will need to intentionally support preschoolers' with ASD active participation during shared reading activities.

Book Type

Experts recommend that children have access to a variety of texts across genres (e.g., Young et al. 2007), yet classroom libraries contain little nonfiction literature (Duke and Bennett-Armistead 2003; Kletzien and Dreher 2004; Young and Moss 2006). The use of nonfiction, or informational, texts during shared reading activities may be an important consideration given the strengths that individuals with ASD have in understanding the content of this genre. Fiction stories have high social content that requires readers to take the perspective of the story characters. The ability to make inferences and take others' perspectives is necessary to comprehend fictional texts, which is difficult for many children with ASD (Baron-Cohen et al. 1997). Researchers theorize that texts with lower social content that rely more on general knowledge, as is the case with nonfiction informational texts, are easier for individuals with ASD to understand (Brown et al. 2013).

Repeated Readings

Children's interests are another important consideration in shared reading activities, as it is critical to both engagement and reading comprehension (Routman 2003; Guthrie and Ozgungor 2002). The long-established practice of rereading children's favorite stories is not only developmentally appropriate, but affords children opportunities to hear and use increasingly sophisticated language during successive book readings (Snow 1983; Snow and Goldfield 1983). The extent to which repeated readings is beneficial for children with ASD has not adequately been explored. A common characteristic exhibited by individuals with ASD is insistence on sameness and adherence to routines (APA 2013). Repeated readings add predictability to daily routines, which can benefit children with ASD (Koegel et al. 2003). An overreliance on routines, however, potentially risks behaviors becoming ritualistic and obsessively rigid requiring intervention (Hine and Wolery 2006).

Focus of the Current Study

To maximize the potential of shared reading for improving oral language and emergent literacy skills for children with ASD, there is a critical need for research to identify factors that can promote or inhibit children's engagement in this naturalistic activity. Improved understanding of such factors is critical for intervention development. In this vein, we conducted this observational study of caregivers reading with their children behaviors to address three primary aims: (a) to compare reading styles of caregivers of children with ASD to caregivers of typically developing children; (b) to evaluate differences in shared book reading engagement between children with ASD and typically developing children, and (c) to identify factors related to children's engagement during shared reading.

Method

Participants

The Institutional Review Board at University of Minnesota approved all study procedures and informed consent was obtained from all study participants. Participants across metropolitan areas in the Pacific Northwest and Midwestern regions of the United States were recruited through local preschools, a university research participant registry, community support organizations, and local private therapy providers. In addition, recruitment flyers were posted in waiting rooms of local autism clinics and distributed via professional networks. To be included in the study, caregivers were required to speak fluent English and be able to read books with their child. Children needed to meet the following inclusion criteria: (a) between the ages of 3–5 years; (b) speak English as his or her primary language; (c) not yet read fluently; and (d) have some language facility, routinely using three or more independent units (e.g., "Baby no eat"; Lord et al. 2012) to communicate as reported by their caregivers. Expressive language ability was confirmed by the research team through direct observation during the first testing session. We imposed specific communication inclusion criteria to ensure that children were able to respond to questions posed to them during formal assessments as not to violate standardization. Children who enrolled as part the comparison sample were typically developing with no caregiver concerns about their child's development.

Children with ASD were required to have a clinical diagnosis or educational identification of autism spectrum disorder to participate in the study. We used the

Autism Diagnostic Observation Schedule, Second Edition (ADOS-2; Lord et al. 2012) to confirm a diagnosis of ASD. Some children had previously participated in a research study and provided proof of an ADOS-2 administration conducted within two years of the study. For all other child participants, a member of the research team administered the ADOS-2 to confirm autism eligibility. All children who were recruited in the autism sample met the cut-off score for autism according to the ADOS-2.

A total of 37 child participants (24 male; 13 female) and their caregivers (3 fathers; 34 mothers) were included in this study. Of these children, 17 were identified with ASD (13 male; 4 female) and 20 were typically developing (11 male; 9 female). Child participants ranged in age from 3 years 0 months to 5 years 9 months ($M = 4.59$, $SD = 0.70$) and attended preschool. The majority (97%) of caregiver participants self-reported their child's race as White, and all caregivers had completed a postsecondary degree or higher. No significant differences between groups were reported across key demographic variables of race, gender, caregiver education, or socioeconomic status. A summary of demographic information is presented in Table 1.

Procedures and Tasks

All participants were seen on four to five occasions by a member of the research team. Each visit lasted between 60 and 90 min. Caregivers were given the option of conducting the study at their home or at the university lab. Thirty-four families had all study procedures conducted in their home. Three families chose to have the ADOS-2 administered at the university lab; all other procedures took place in their home.

Formal Assessments of Child Functioning

Members of the research team administered all assessments used in the present study. All research team members had a minimum of 5 years of experience working with children with autism in school, home, or clinical settings and held

Table 1 Participant demographic summary

	Autism (n = 17) M (SD)/frequency (%)	Typical (n = 20) M (SD)/frequency (%)	
Chronological age (years months)	4.61 (.69)	3.96 (.89)	**t(35) = −2.46, p = .02, two-tailed**
Gender			
Male	13 (76%)	11 (55%)	X^2 (1, $n = 37$) = 1.55, $p = .21$, $phi = -.25$
Female	4 (23%)	9 (45%)	
Race			
Caucasian	16 (94.1%)	19 (95%)	
Other/no response	1 (5.9%)	1 (5%)	
Battelle Development Inventory (Battelle)			
Personal social domain SS	81.29 (11.44)	118.65 (10.48)	**t(35) = 10.36, p < .001, two-tailed**
Communication domain SS	92.35 (22.65)	127.65 (9.98)	**t(21.22) = 5.95, p < .001, two-tailed**
Cognitive domain SS	87.12 (20.94)	121.85 (9.18)	**t(21.18) = 6.34, p < .001, two-tailed**
Test of preschool early literacy (TOPEL)			
Print knowledge SS	109.00 (13.86)	109.05 (16.57)	t(34) = −0.01, p = .99, two-tailed
Definitional vocab SS	91.24 (18.71)	107.35 (8.83)	**t(22.29) = 3.33, p = .003, two-tailed**
Phonological awareness SS	93.06 (20.69)	102.45 (11.45)	t(24.05) = 1.67, p = .11, two-tailed
Early literacy SS	92.82 (29.39)	107.45 (10.72)	t(19.61) = 1.95, p = .06, two-tailed
Caregiver's highest level of education			
College	8 (47%)	5 (25%)	X^2 (1, $n = 38$) = 2.08, $p = .14$, $phi = -.28$
Graduate/doctoral/advanced degree	8 (47%)	15 (75%)	
No response	1 (6%)		
Household income			
$25,000–$49,999	3 (18%)	2 (10%)	
$50,000–$99,999	4 (24%)	1 (5%)	
$100,000 or greater	8 (47%)	15 (75%)	
No response	2 (11%)	2 (10%)	

Bold values indicate statistically significant at $p < .05$

TOPEL and Battelle scores are standard scores with a mean of 100 and standard deviation of 10

advanced degrees in special education. A person who had experience administering the assessment instruments for educational identification purposes trained the research team in the administration of all formal measures. The training procedures were as follows: (a) a didactic in-service training session that included a description of each assessment, administration modeling, and opportunities to practice administration with each other; (b) practice administration on a child who was not part of the study; (c) supervised administration with a study participation with coaching and feedback. Members of the research team videotaped their administration of each assessment a minimum of three times throughout the study. The lead trainer reviewed these tapes to ensure that administration adhered to standardized procedures.

Battelle Developmental Inventory, Second Edition

Three subscales of the Battelle Developmental Inventory, Second Edition (BDI-2; Newborg 2005) were administered across the first three visits: cognitive, communication, and personal-social domains. The BDI-2 is a widely used direct assessment for evaluating developmental skills of young children that has evidence of adequate internal consistency and test–retest reliability (Alfonso et al. 2010). The instrument is commonly used for determining children's eligibility for services and can serve as a predictive measure of future social-behavioral development for children with disabilities (Berls and McEwen 1999; Merell and Mauk 1993).

Test of Preschool Early Literacy

The Test of Preschool Early Literacy (TOPEL; Lonigan and Phillips 2007) was administered during visits four and five (if needed). The TOPEL is a norm-referenced standardized tool comprised of three subtests: phonological awareness, print knowledge, and definitional vocabulary. In addition, the subtest scores were combined to generate an Early Literacy Index. The TOPEL has evidence of convergent validity and has been demonstrated to be predictive of later reading success in kindergarten and first grade (Wilson and Lonigan 2009) and has been used in studies with children with disabilities or at-risk populations (e.g., Easterbrooks et al. 2008; Justice et al. 2015; Kaminski et al. 2014) including those with ASD (e.g., Fleury and Schwartz 2017; Rosenberg 2008; Whalon et al. 2015).

Caregiver-Child Book Reading

We used the Advantage-TASA Open Standard (ATOS) readability formula to control for text complexity that children heard during shared readings (http://www.renaissance.com/products/accelerated-reader/atos-analyzer). The ATOS readability formula takes into account various predictors of text complexity (i.e., average sentence length, average word length, and word difficulty level). All books used in the study had an ATOS classification between 2.3 and 2.4 consistent with common core state standard (CCSS) recommendations for children in lower grades (CCSS Initiative 2010). Caregivers read three preferred books selected from their child's personal library, three unfamiliar fictional books, and three unfamiliar nonfictional books. Members of the research team provided the unfamiliar fiction and unfamiliar nonfiction books used in the study, which were vetted for age appropriateness by the book publisher and the principal investigator who is a former preschool teacher. Caregivers were instructed to select books that they had not previously read with their children during the unfamiliar book reading conditions. The order of book reading was counterbalanced across sessions. Caregivers were instructed to "read as they would typically" and were not provided any specific direction or guidance. Reading sessions were videotaped for data coding purposes.

Quality of Book Reading

The overall quality of book reading was measured using the Adult-Child Interactive Reading Inventory (ACIRI; DeBruin-Parecki 2007). The ACIRI assesses critical adult and child behaviors that can be observed during shared reading activities organized around three categories: (a) enhancing attention to text, (b) promoting interactive reading and supporting comprehension, and (c) using literacy strategies. Each category consists of four interactive behaviors, for a total evaluation of 12 specific literacy behaviors. Numerical scoring for each specific literacy behavior is based on a 0–3 scale as follows: zero indicates ''no evidence of the behavior;" one indicates the behavior occurs ''infrequently;" two indicates the behavior occurs ''some of the time;" and three indicates the behavior occurs ''most of the time.'' Scores may be reported by individual item, mean scores across the three categories, and by a total ACIRI mean score. Interobserver agreement was calculated on 25% of videos for each sample using a point-by-point method in which the number of agreements was divided by total (agreements plus disagreements) and multiplied by 100. Overall estimates were acceptable for both the typically developing group ($M = .90$; range .68–1.00) and ASD group (M .91; range .77–1.00). A total of seven videos (three typical; four ASD) reached lower than 80% agreement. These videos were consensus coded for final analyses.

Child Engagement

We measured children's engagement during book reading sessions using Multiple Option Observation System for

Experimental Studies (MOOSES; Tapp et al. 1995) and ProCoder 2.0® software which allowed us to create a tailored template to record and analyze specific variables of interest. Definitions of engagement were adapted specifically for book reading based on a joint engagement coding system (Adamson et al. 2004; Wong and Kasari 2012). Coding definitions for engagement states are presented in Table 2. Members of the research team viewed each book reading session using a continuous time sampling procedure to record the amount of time children spent in different engagement states. A percentage of the total time a child spent in each engagement state was calculated for each book reading. Calculating a rate of engagement in each state allowed us to compare engagement data across book readings that differed in duration. The average interclass correlation coefficient (Kappa) established between two independent coders was calculated on 25% of the videos in each sample. Kappa estimates were in the acceptable range for the typically developing sample ($M = .92$; range .87–1.00) and the ASD group (M .90; range .80–1.00).

Results

Group Differences

Quality of Adult Reading

A mixed between-within subjects analysis of variance was conducted to assess the impact of group status (typical, ASD) on quality of caregiver book reading as measured by the ACIRI across different book type (familiar, fiction, non-fiction). There was a substantial main effect of book type, Wilks' Lambda = .652, F (2, 34) = 9.091, $p = .001$, partial eta squared = .35 with both groups demonstrating higher quality reading during nonfiction book reading. The main effect comparing the two groups was not significant, F (1, 35) = .753, $p = .391$, partial eta squared = .021 suggesting no differences between the typical and ASD samples in overall quality of book reading. The interaction between group and book type was also not significant, Wilks' Lambda = .966, F (2, 34) = 0.55 $p = .93$, partial eta squared = .03.

Engagement States

Primary analyses were conducted using analysis of variance statistic to compare dependent variables of engagement between caregiver-child dyads in the typical and ASD groups and to explore if there were differences across book type. Due to low occurrence of *unengaged* and *disruptive* states, we collapsed these into one state

Table 3 Proportion of child engagement during reading across book genres

	ASD M (SD)	Typical M (SD)
Active engagement		
Familiar	38.26 (15.33)	34.32 (10.68)
Fiction	32.23 (15.41)	28.36 (15.51)
Non-fiction	27.50 (13.62)	21.91 (12.08)
Passive engagement		
Familiar	46.60 (19.10)	55.22 (13.50)
Fiction	54.57 (18.47)	63.04 (19.37)
Non-fiction	51.02 (18.28)	73.31 (17.41)
Disruptive/unengaged		
Familiar	12.99 (16.96)	8.90 (6.42)
Fiction	12.49 (16.49)	5.75 (8.21)
Non-Fiction	18.91 (23.93)	3.87 (7.54)

Table 2 Behaviors coded during book reading

Engagement state	Definition
Disruptive	The child is engaging in behavior that impacts his/her ability to attend and engage in book reading. To be coded as disruptive, it should affect the reader's behavior and stop them from reading. Parent redirective (e.g., not in your mouth; let's not do that) can be a cue that the child's behavior is disruptive to the activity
Unengaged	The child is not attending to the reading activity. The child does not focus his attention to the book or the adult reader. This includes looking around the room, and talking/singing to self in repetitive, non-purposeful manner, or behaviors that are unrelated to the task at hand (e.g., hugging, playing with jewelry), but is not at a level that is disruptive to the book reading
Passive engagement	The child looks at the book and/or the adult reader as the she reads the book. Although the child is sitting and appears to be attending appropriately, no interaction occurs. The adult reads the text but does not prompt the child to participate verbally (e.g., make comments) or nonverbally (e.g., request the child to point or turn the page)
Active engagement	The child is actively involved with the book reading and coordinates his/her attention to both the adult reader and the book. Either adult or child may be directing or initiating the interaction. Communication may be initiated vocally or non-vocally, with the reading partner, regarding the book. In either case, the child is sharing attention to another person and to an object. Child or adult could be driving the interaction
Unable to code	Unable to code engagement because the reader and/or child are outside of the camera frame

for analyses, which we identified as *non-engagement*. We present a summary of descriptive information on these variables in Table 3.

A mixed between-within subjects analysis of variance was conducted to assess the impact of group status (typical, ASD) on children's levels of engagement across different book type (familiar, fiction, nonfiction). We analyzed the data to determine if differences existed in proportions of time spent in each engagement state between groups. Group differences were detected in passive engagement and non-engagement. Children in the typical group engaged in greater proportion of passive engagement that those in the ASD sample, F (1, 35) = 8.183, p = .007, partial eta squared = .189; whereas children with ASD demonstrated greater non-engagement than children in the typical group, F (1, 35) = 5.30, p = .027, partial eta squared = .132. There were no differences between groups in children's joint engagement during book reading, F (1, 35) = 2.17, p = .15, partial eta squared = .058.

There was a substantial main effect of book type on levels of joint engagement, Wilks' Lambda = .70, F (2, 34) = 0.69, p = .003, partial eta squared = .30 with both groups showing most joint engagement during familiar books. Children in both groups demonstrated greater proportion of passive engagement during nonfiction book readings, Wilks' Lambda = .715, F (2, 34) = 0.677, p = .003, partial eta squared = .285. Book type did not relate to overall levels of non-engagement, Wilks' Lambda = .90, F (2, 34) = 0.90, p = .165, partial eta squared = .10. There was, however a significant interaction between group and book type, Wilks' Lambda = .80, F (2, 34) = 0.80, p = .02, partial eta squared = .197 with the ASD group demonstrating most non-engagement during nonfiction book reading whereas children in the typical group demonstrated the least non-engagement during nonfiction book readings compared to either familiar or fiction texts.

Factors Related to Engagement States

To identify factors associated with each engagement state, a series of two-level multilevel analyses were run with lme4 (Bates et al. 2015) for proportions of engagement states. Up to nine book-reading observations were nested within each child-caregiver dyad. Random effects were only included for the intercepts at the observation level, all other effects were treated as fixed effects. Because the three engagement states are perfectly linearly correlated, models were built for only joint and passive engagement. Next, we engaged in a model building procedure using a deviance test for observation and child-caregiver dyad level factors. A summary of the multilevel regression analyses for engagement states is presented in Table 4. We examined assumptions for the final models for joint and passive engagement and found all were met. The final models that best explained the proportion of time children spent in each engagement state in any given observation are below.

$$PROPJOIN_{ti} = \beta_{00} + \beta_{10}FAMILIAR_{ti} + \beta_{20}FICTION_{ti} + \beta_{30}NONFICTION_{ti}\beta_{40}AQUALITY_{ti} + r_{0i} + e_{ti}$$

$$PROPPASS_{ti} = \beta_{00} + \beta_{01}FAMILIAR_{ti} + \beta_{02}FICTION_{ti} + \beta_{03}NONFICTION + {}_{ti}\beta_{04}AQUALITY_{ti}\beta_{05}STATUS_{i} + \beta_{06}COG_{i} + r_{0i} + e_{ti}$$

The proportion of time a child spent jointly engaged in the book-reading with their caregiver was explained best by situational-level variables of book type and the overall quality of the adult's book reading for that book. The final model reduced nearly all of the variance between child-caregiver dyads (97%) as compared to the unconditional, and reduced 9.5% of variance between book-reading observations within child-caregiver dyads. While both book type and adult quality of reading are meaningful, some specific factors stand out as statistically significant. When controlling for book

Table 4 Summary of multilevel regression analysis for engagement states

Predictor variable	Joint engagement		Passive engagement	
	Beta	95% CI	Beta	95% CI
Situational-level				
Intercept	−0.07	[−.15, 0.017]	.606***	[.30, 0.91]
Genre fiction	−0.08***	[0.12, −.04]	0.08**	[.03, .12]
Genre nonfiction	−0.03	[−0.7, 0.01]	−0.04	[−.09, .01]
Adult reading quality	0.23***	[0.27, .18]	−0.18***	[−.12, −.23]
Child-level				
Cognitive			0.01**	[.003, .01]
Communication				
Status (ASD/TD)			0.02	[−.09, 0.14]

Intercept is for familiar books, *CI* confidence interval, n = 36, p < .01**, p < .001***

type, the adult's reading quality was significantly associated with the amount of time a child was jointly engaged ($df = 282$, $t = 9.93$). In regard to book type, only unfamiliar fiction books were significantly negatively associated with a child's joint engagement when controlling for adult's overall reading quality ($df = 287$, $t = -4.109$). These findings suggest that higher quality book reading is significantly predictive of the amount of time a child spent engaging jointly.

Passive engagement was best explained by a model that included both situational-level and child-level factors. The final model reduced variance between caregiver-child dyads by 55% as compared to the unconditional, and reduced variance between book-reading observations within caregiver-child dyads by 15%. There was a significant negative correlation between adult book-reading quality and children's passive engagement, suggesting that lower-quality book-reading strategies by the adult was associated with an increase in the amount of time a child spent passively engaged ($df = 325$, $t = -6.470$) when controlling for child's status (ASD or typical), cognitive skills, and the book type. Unlike joint engagement, both familiar and fiction books were significantly and positively correlated with the proportion of time a child spent passively engaged (familiar, $df = 40.5$, $t = 3.87$, fiction, $df = 289$, $t = 3.32$). A child's status did not have a significant effect on passive engagement when controlling for the other factors. A child's cognitive abilities were significantly positively associated with passive engagement, suggesting that, when controlling for a child's status, book type and adult reading quality, a child with higher cognitive skills was passively engaged more often than a child with lower cognitive skills ($df = 36$, $t = 3.34$).

Discussion

Caregivers play an integral role in the development of children's healthy reading behaviors and attitudes (Bus 2001; McKee and Rhett 1995; Payne et al. 1994). We focused specifically on the practice of shared reading because it is a developmentally appropriate activity practiced in many homes and early childhood programs to promote language and early literacy skills. The caregivers in our study did not differ in their overall quality of book reading across groups; yet we detected group differences in children's engagement during readings. Our findings suggest that children with ASD spend less time passively engaged in book readings (e.g., listening to the reader and looking at books) compared to typically developing children, and more time engaging in either disruptive or unengaged behaviors during shared reading activities. This is consistent with previous research in which caregivers reported that their children with ASD had difficulty attending to books and lacked enjoyment during shared reading (Lanter et al. 2013).

We extended previous descriptive research of shared reading by exploring factors related to children's engagement in shared book reading activities with their caregivers. Children's disability status did not factor meaningfully into the model explaining joint engagement. Rather, joint engagement was best explained by two situational factors: adult reading quality and book type. The finding that caregivers' reading style influenced engagement during reading activities for children with ASD is consistent with previous research involving typically developing children (Chow et al. 2008; Ezell et al. 2000; Hargrave and Senechal 2000). Caregivers' reading style differed across book type, with higher quality book reading demonstrated when reading nonfiction books compared to either fiction or familiar texts. Higher quality nonfiction book reading related to lower proportion of non-engaged behaviors only for typically developing children, while an inverse relationship was determined for children with ASD. Children with ASD engaged in proportionately more non-engaged behavior during nonfiction book reading compared to the other book types, which is counterintuitive given the aforementioned relationship between book reading quality and children's engagement.

Examining the tool we used to assess book reading quality may provide some insight to interpreting these results. The adult child interactive reading inventory (ACIRI; DeBruin-Parecki 2007) was developed to assist caregivers and practitioners in monitoring and improving their reading interactions with young learners. The items that make up the inventory are based on current knowledge of research-based literacy practices, which until recently, focused exclusively on typically developing children and those considered at-risk for developmental delays. Accordingly, additional research is needed to validate this tool for children with disabilities, including those with ASD. Although caregivers in this study employed many literacy strategies consistent with the ACIRI tool, it may have been in overabundance and not well aligned with their child's skills, both of which could have deleterious results on children's engagement during reading activities. Book reading practices considered to be "high quality" for typically developing children may not necessarily align with what works best for some children with ASD.

Children with ASD demonstrated highest proportions of joint engagement when reading familiar books from their personal libraries after controlling for adult book reading quality. This finding lends partial support for repeated book readings for children with ASD, which has long been advocated by early childhood professionals for typically and at-risk children because it affords the adult reader opportunities to scaffold children's language and knowledge about the story content (McGee and Shickedanz 2007; Morrow 1988). Repeated book readings have the added benefit of increasing predictability, which may be advantageous for

children with ASD given their proclivity for predictability and routine (APA 2013; Koegel et al. 2003).

Although familiar books related to increased proportions of joint engagement for children with ASD, it is premature to suggest that caregivers should favor their child's favorite books when selecting texts. The reasoning that underlies experts' recommendation of repeated book reading is that increased familiarity with the characters and plot allows for more language opportunities during reading. This assumes that caregivers and their children converse about different aspects of the text in increasingly complex ways, providing children opportunities to learn new vocabulary and improve listening comprehension skills. We are not able to determine that this occurred with caregivers and their children with ASD in this study. Given that ASD characterized in part by proclivity towards routine and sameness, it is probable that caregivers of children with ASD will read familiar books in a routine manner, posing questions and comments that are likely to elicit responses from their child. This scenario would have the undesired outcome of limiting vocabulary exposure and reinforcing children's rigidity. Improved levels of joint engagement during familiar books observed in the current study may actually reflect highly routinized conversations that occur between the caregiver and child, rather than complex social communication behaviors that would support oral language and emergent literacy development.

Finally, children's cognitive ability was positively associated with the proportion of time spent in passive engagement. In other words, children with lower cognitive skills were observed looking at the book or caregiver less than children with higher cognitive skills. This finding points to a particular subset of individuals who may be potentially at greatest risk for reading failure and will likely require additional support and instruction to access, and benefit from, shared reading. Research involving different book modifications and communication supports show promise for elementary-age students with ASD and intellectual impairments. Research-based book modifications include: laminating and restructuring book pages within a binder to increase durability to promote physical interaction with books; inserting summary statements of main ideas throughout the book; and affixing physical objects (Browder et al. 2011) or visual supports (Mucchetti 2013) on pages to correspond with key vocabulary. Rather than reading the text directly from the story, researchers have made instructional accommodations to elicit active participation by asking questions and requesting children to pictures (Browder et al. 2011) and teaching students to respond to adult questions using a mode appropriate for their skill level (e.g., using objects in book, voice output device, eye gaze board, picture response board) combined with a systematic prompting procedure (Browder et al. 2011; Mucchetti 2013). These book modifications and instructional accommodations related to improvements in measures of student engagement and the number of correct responses to adult questions for elementary students, but future research is needed to evaluate the appropriateness of using these strategies with an early childhood population.

Additional Considerations

The present study offers preliminary information about factors related to children with ASD's engagement during shared book reading. These findings are drawn from a relatively homogeneous sample. Caregivers in this study were similar in terms of racial composition, income, and education. In addition, the children in this sample are not necessarily representative of the general population given the average communication scores for the ASD sample, and above-average performance for the typical sample across all developmental domains assessed. Readers should interpret these findings to populations who share similar demographic profiles. We did not evaluate the extent to which these findings extend to a larger heterogeneous ASD population and readers should not generalize results for this reason.

There are limitations with the current study that warrant further consideration. We discussed the first limitation earlier, but it bears repeating. The measure we used to assess quality of adult reading quality was developed based on current best practices for typically developing children. This measure is appropriate for the ASD population assuming that emergent literacy development for children with ASD unfolds similarly to those of typically developing children. Additional research about emergent literacy development, and the validation of emergent instruments for this population, is needed. Second, our sample size may have limited our ability to detect statistically significant differences. A larger sample size would also allow researchers to explore a broader range of child and environmental factors on children's engagement. Third, we assumed that children had previous exposure to the texts selected during familiar book readings. We did not directly ask families how many times they had read the selected books, but this would be an important factor to consider in future studies as repeated exposure impacts the child's familiarity with the text. Finally, data presented in this study offer cross-sectional information about a specific facet of emergent literacy experiences for preschoolers with ASD. We cannot ascertain the extent to which these experiences relate to later reading achievement for this population.

Conclusion

Recent research reveals that children with ASD may demonstrate deficits in aspects of emergent literacy as early as preschool (Fleury and Lease 2018; Westerveld et al. 2017). This suggests that some young children with ASD require

developmentally appropriate instruction to develop early literacy behaviors that form the foundation for reading achievement. Shared book reading is a developmentally appropriate activity that affords children opportunities to develop important language and emergent literacy skills that form the foundation for reading success. We chose to specifically focus on the quality and quantity of children's engagement during shared reading activities in this study because children's ability to engage in activities has been shown to predict later school readiness and success (McWilliam et al. 2003). We identified both child and situational factors that relate to children's engagement during book reading. These factors—particularly the malleable factors of book type and adult reading quality—have potentially important implications for intervention development.

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Author Contributions VF conceived and designed the the presented study, planned, and supervised the work. Both VF andMH conducted the analysis of the results and contributed to the writing of the manuscript.

Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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